Barren ground, typical of severely salinised flats and lower slopes, is widespread in virtually all but mountainous, high rainfall parts of Victoria. Sheet wash of topsoil and groundwater discharge in erosion gullies, adding sediment and salt to water supplies, are associated with dryland salting. Grassy islands carry a variable cover of valueless *Hordeum maritimum*.

DRYLAND SALINITY SYMPOSIUM – INTRODUCTION

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Throughout history, secondary salinisation (i.e. salinisation induced by particular landuse practices) has resulted in declining agricultural productivity and even total crop failure. In the case of irrigation-related secondary salinisation, water which is deliberately added to the soil is often in excess of plant requirements and percolates downwards to fill the available groundwater storage, causing watertables to rise. Dryland secondary salinity, on the other hand, results from reduced plant water usage which follows the replacement of forests by mainly annual pasture or by certain cropping systems, especially those which include long fallow in the rotation (Jenkin 1979, 1981, Peck 1977).

At the same time, the existence of natural salting should not be overlooked and it is important to distinguish between primary and secondary salinisation. However, there is abundant evidence, particularly in the Victorian Mallee, and the Western Australian wheat belt of man-induced reactivation or spread of natural salinas. In Victoria, most areas of primary salinisation are groundwater discharge areas (Lawrence 1975). Nevertheless, there are large areas of inherently saline subsoils, particularly in inland Australia which, when exposed by the erosion of the topsoil, form salt scalds (Working Party on Dryland Salting in Australia 1983).

The emergence of saline groundwater at the surface produces a salt seep (Peck 1978). There have been many attempts to classify seep phenomena, but none is entirely satisfactory. In this symposium, the word seep is used to cover all secondary groundwater discharge areas despite their variation of form in detail. Besides soil salting, although genetically related to salt seepage, is the increased salinity of surface and groundwaters. Although this is very difficult to quantify, there are numerous cases where it has become significant, not only to individual landholders but also to large communities such as Perth.

Dryland seepage salting is widespread in south-western, southern and eastern Australia, on the Great Plains of North America and in recently-cleared areas of south-east Asia and central America. Thus, the regions affected vary widely in both climate and physiography. Within each area there is some variation in expression, depending on geological structure, topography and climate. In this regard, Victoria appears to be the most variable of all (Jenkin 1981).

In Western Australia, the first concern was in the early 1920s where water used for steam locomotives was becoming noticeably more saline (Wood 1924). It was also recognised that the increasing salinity levels corresponded with the area cleared for agriculture, although it was probably J. G. Robertson, a grazier in western Victoria who, in a letter to Governor La Trobe in 1854, was the first in Australia to relate seepage salting to clearing and overstocking. As far as is known, this is the first record anywhere of such an event.

At first, dryland salting in agricultural areas was regarded as a relatively superficial phenomenon. Rainwater infiltrating the soil and moving downslope as soil throughflow was supposed to carry dissolved salts with it and eventually emerge on the valley floor where the salts were concentrated (Cope 1958). However, later work showed that discharge of deeper groundwater was the main factor, although the details of the systems operating were only partly known (Bettenay *et al.* 1964, Jenkin & Irwin 1976, Macumber 1969, Peck 1978). More recently in Australia, research has been concentrated on an attempt to determine the processes involved and to define more clearly the mechanisms operating, particularly in Western Australia, Victoria, South Australia and Queensland. This has met with considerable success and there is now every confidence that the principles involved in secondary salinisation are known.

There are, however, wide variations in detail and the stage has been reached in which it is necessary to "characterise" individual areas or regions. This includes determining and mapping the hydrogeological, geomorphic and soil characteristics of an area so that zones of different groundwater recharge potential can be isolated. The resulting synthesis is then compared with the current landuse map and a management prescription developed for the area. This is designed to maximise water usage by plants and, ideally, to increase agricultural productivity. However, these plans are subject to periodic modification in response to demand and to other factors such as drought. The scales involved vary from quite small hydrological systems which can be treated locally, through regions in which relatively large areas must be treated simultaneously to be effective, to major sedimentary basins in which the recharge area may be far distant from the surface discharge sites, making control extremely difficult.

In this Symposium, different research approaches into the processes and mechanisms involving dryland salinisation, on both local and regional scales, are examined. Further, salinity control involves land management, of the recharge areas as well as the affected sites. The biological aspects of this are also considered. However, although control through the use of suitable plants and appropriate management is likely to dominate the attack on dryland salinity, engineering methods may be important in some areas, particularly in the collection and safe disposal of runoff and the drainage of wet sites and salt seeps.

Salinity affects the community in various ways, from individuals to large groups of the population. There are several aspects to this. Loss of income, falling property values, increasing costs and landscape deterioration are all involved, and the social consequences can be quite significant in the worst-affected areas. Only some of these socio-economic problems are covered, an indication that herein lies an important field for investigation.

As shown by the papers in this Symposium, dryland salting is a highly complex phenomenon and, to many people, a serious problem. In Victoria, the technical aspects of dryland salinity amelioration are far more complex than elsewhere, a wide range of scales and hydrogeological conditions being involved. As a consequence, solutions, although similar throughout in broad principle, must nevertheless be varied in detail from one salinity province to another. The first requirement then, is to determine the characteristics of each province in some detail. For the next step, which is to prescribe appropriate land management systems, a detailed knowledge of plant-water-soil relationships is essential. Thirdly, the social and economic effects of dryland salinisation are only now starting to be fully appreciated by the community at large. It is probably the water quality aspect which will affect most people directly. This is an area in which further intensive research is needed and it may be that radical departures from traditional agricultural and water supply practice will be necessary. Finally, wide acceptance of the management proposals and concerted action by landholders and government is essential for the effective control of dryland salting.

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